

## Research Paper:

## Effectiveness of Outcome-Based Education on Maintaining Semi-Upright Position of Patients Under Mechanical Ventilation



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**ABSTRACT**

**Background:** According to studies, despite the proven and effective role of mechanical ventilation on patients with respiratory failure, the positive effects of semi-upright position on oxygenation and ventilation of patients under mechanical ventilation and nurses' training about them have been neglected. This study aimed to investigate the effect of outcome-based education of nurses on maintaining the semi-upright position in mechanically ventilated patients (MVPs).

**Methods:** This study was an outcome-based research and designed with pretest/posttest. All nurses of intensive care unit of Firozgar Hospital participated in a 2-hour individual training course with the outcome-based approach on maintaining the semi-upright position in MPVs. The obtained data were collected by a checklist, including questions about demographics, knowledge, and performance. Assessment of the performance was performed via observation and completing checklist by the researcher. After collecting data, they were analyzed through descriptive and inferential statistics using SPSS V.20.

**Results:** The results showed that the Mean ( $\pm$ SD) score of nurse's knowledge before and after training were 47.41(23.63) and 89.63(10.18), respectively and administering semi-upright position in MVPs in the posttest was significantly increased.

**Conclusion:** The outcome-based education on maintaining the semi-upright position in MVPs has positive effects on knowledge and performance of nurses. We recommend use of this method in nurses' curriculum.

**1. Background**

**E**

ach year, lung diseases affect a lot of people that reduce their performance in daily activities, also they are one of the most

important causes of mortality around the world (Bousari et al. 2014). Acute respiratory failure incidence and prevalence is rising and accounts for 137 per 100000 people in America and only 36% of hospitalized people with this diagnosis survive (Bassampour et al. 2008).

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Mechanical ventilation is one of the most common forms of prescriptive medical treatment for patients admitted to Intensive Care Units (ICUs) (Chaiwat et al. 2010). It is an integral part of treatments that most patients in critical stages or with multiple complications need (Radhakrishnan, Ghosh & Dash 2007). The advent of mechanical ventilation device with positive pressure to support oxygenation and ventilation in patients who are unable to resume normal breathing for any reason, have saved the lives of many patients from imminent danger (Mohammadi, Ebrahimian & Mahmoudi 2009).

Mechanical ventilation can have adverse effects on the cardiovascular system (decreased cardiac output), respiration, gastrointestinal tract, musculoskeletal system, water and electrolytes state, increased intracranial pressure (Fiona et al. 2007), and psychological status of the patients (Takekawa 2002). The position of the patient in the bed has an impact on body vital signs like respiratory, musculoskeletal system, and so on (Smeltzer et al. 2010). Therefore, maintaining correct posture is of great importance for critically ill patients, and especially those who are under mechanical ventilation.

One of the best and most effective strategies to reduce the above-mentioned problems is to maintain a semi-upright position or in other words raising the head for 30 to 45 degrees (Sadeghi, Safari, & Karimlou 2008). In this position, lung functional residual volume decreases and airway resistance increases (Agostoni & Hyatt 1986). Although, these changes are insignificant in healthy people (Pankow et al. 1998), it is of great importance in people with lung problems who are under mechanical ventilation with positive pressure. Because, low oxygenation is among conditions which creates dangerous situations for these patients and can lead to complications such as hypoxia, arrhythmia, loss of consciousness, and even death (Sadeghi, Safari, & Karimlou 2008). One study has emphasized the effect of a semi-upright position on reducing microaspiration through endotracheal tube (Muscedere et al. 2008). The results of another study showed that in semi-upright position, the imposed weight on organs decreases and normal skeletal system position is better maintained (Viir 2010).

Unfortunately, the majority of nurses are not aware of the benefits resulting from semi-upright position for patients and in most cases, maintaining a semi-upright position is not considered as one of the interventions necessary for mechanically ventilated patients (MVPs) (Van Nieuwenhoven et al. 2006). Therefore through appropriate education, nurses' knowledge about the necessity of maintaining semi-upright position in MVPs should be

increased, furthermore, they should be encouraged to maintain this position in clinical patients. Today, outcome-based education (OBE) is known as a standards-based education. OBE system is, in fact, focuses both on students' learning and their performance (Paterson, Hesketh & Harden 2002). As noted above, because of the importance of observing semi-upright position in maintaining and improving the health of acute patients and also shortage of articles about the effect of OBE on the training of nurses, we decided to conduct a study with the objective of "the effect of OBE in nurses with regard to maintaining semi-upright position in MVPs".

## 2. Materials & Methods

### Study design and participants

This study is an outcome research conducted based on Donabdin theory (1987) to provide some opportunities for stronger scientific proof of nursing performance (Grove, Burns & Gray 2012). Using this method, the researcher evaluated and studied the effect of OBE on nurses to maintain semi-upright position in MVPs. The study design is practice pattern profiling. The current study setting comprised ICUs of neurosurgery unit of Firoozgar Hospital which includes Neurosurgery ICU and Beh Afarin ICU. This trial has been recorded at Clinical trials Registry site (No. IRCT 9311449203) and verified by Iran University of Medical Science. This research conducted with the approval of the University Research Ethics Committee with code No. IR.IUMS.REC.1394.9211449203.

The study sample included all patients under mechanical ventilation hospitalized during the 4-week period (2 weeks before training and 2 weeks after training). Our study samples were selected using convenience sampling method and then their written consent forms were taken. Regarding the study nature which is an outcome research, no inclusion or exclusion criteria should be considered. However, it is necessary to identify those who do not receive the intervention or treatment. As a result, checking the status of all patients hospitalized in neurosurgical ICU of Firoozgar Hospital during the period of data collection was considered in the inclusion criteria. The study exclusion criteria included having special clinical states such as shock or unstable blood circulation that made it impossible to maintain these patients in suitable position.

### Data collection

The data collection instrument for this study was a 3-part designed checklist; 1) demographic information

(client code, number of beds, the name of the ward, age, gender, cause of admission), 2) information needed to evaluate semi-upright position for patients under mechanical ventilation to assess the performance of nurses (a table for observing patient’s state), and 3) a section related to the knowledge of nurses, including 5 questions with 4 options (scores ranging from 0 to 5). The validity of the instrument was confirmed using content validity by 8 members of the Faculty of Nursing and Midwifery of Iran Medical Sciences. The reliability of the instruments was evaluated by simultaneous observation of the investigator and research assistant and the correlation coefficient using Cronbach  $\alpha$  which was 0.87 representing the reliability of the instrument used.

**Intervention**

In this study and before nurses’ training, the expected outcomes of education was sent to nurses via SMS to their mobile phones. The messages were sent to them for a week. Then, the content of the training program, including its necessity, importance, and methods of maintaining a semi-upright position in MVPs was provided to each individual during a 2-hour lecture and using prop.

Also during training, the performance of nurses were observed and in the event of not observing semi-upright position in MVPs, they were retrained. After viewing the observance of two semi-upright position for each nurse, the researchers were ensured of the training content received by every nurses. It should be noted that in this study, the performance of nurses with regard to observing semi-upright

position in MVPs was investigated using a prepared checklist before and after training (two weeks after the course).

**Data analysis**

Data analysis was carried out by SPSS V.20 and using descriptive and inferential statistics such as Kolmogorov-Smirnov, Chi-square, and Wilcoxon tests. P-values less than 0.05 were considered as statistically significant.

**3. Results**

Results of the demographic data of nurses showed that 70.4% of participating nurses in the study were female and 29.6% were males and most nurses (96.3%) had a bachelor’s degree and a few of them (3.7%) had master’s degree. Their Mean ( $\pm$ SD) work experience was 3.89 (2.02) years and study participants had mostly (18.5%) two or three years of work experience and the least work experience among the study participating nurses was 3.7%. Most participating nurses in the study (25.9%) had one and two years experience of working in the ICU and the minimum work experience of study participants in the ICU was 8 months (3.7%) and the Mean ( $\pm$ SD) work experience was 2.77(1.72) years. In terms of the working shift, 14.8% of nurses participating in the study was working on the night shift, 7.4% in the night-evening shift and 77.8% of them worked with rotating shifts. Mean ( $\pm$ SD) weekly working hours of nurses participating in the study was 55.97(10.55) weeks. The Mean ( $\pm$ SD) hours of retraining nurses participating in the study was 6.37(6.42) hours and most nurses did

**Table 1.** Examining and comparing nurses’ knowledge before and after the OBE to maintain a semi-upright position in mechanically ventilated patients (n=990)

Knowledge Score	Before Intervention	After Intervention
Mean $\pm$ SD	47.41 $\pm$ 23.63	89.63 $\pm$ 10.18
Wilcoxon test	P < 0.001	

SD= Standard Deviation

**Table 2.** Comparison of nurses based on status of patients under mechanical ventilation, before and after the training

	Status Before Training			Status After Training		
	Appropriate	Inappropriate	Total	Appropriate	Inappropriate	Total
No.	339	193	532	365	93	458
%	63.7	36.3	100.0	79.7	20.3	100.0
Chi-square	df = 1, P < 0.001					

not participate in refresher courses (40.7%). The Mean ( $\pm$ SD) age of participating nurses was 28(2.73) years which the most frequent age range belonged to 26-28 years (48.1%) and the least to 32-35 years (11.1%).

Results showed that the Mean ( $\pm$ SD) score of nurses was 47.41(23.63) and 89.63(10.18) before and after training, respectively. The results of the Kolmogorov-Smirnov test also showed that the distribution of knowledge of nurses after the training was not normal (before training  $P = 0.137$  and  $P = 0.003$ ,  $P < 0.05$  is significant). Therefore, comparing scores before and after the nonparametric Wilcoxon test showed that P-value was  $< 0.001$ . Therefore there is a significant relationship between the scores of nurses participating in the present study before and after OBE to maintain a semi-upright position in MVPs (Table 1).

Results of the Chi-square test (Table 2) on 990 patients showed that before nursing training, 63.7% of the patients had a good position and 36.3% had inappropriate position, but after training, 79.7% had good condition and 20.3% had inappropriate condition in terms of position. Therefore, there was a significant difference between patients in terms of the suitable position before and after nurses' training which confirms the effectiveness of training on the performance of nurses in terms of applying semi-upright position in MVPs ( $P < 0.001$ ).

#### 4. Discussion

Based on the study findings, the Mean ( $\pm$ SD) scores of nurses before and after the OBE about maintaining a semi-upright position in mechanically ventilated patients were 47.41(23.63) and 89.63(10.18), respectively, reflecting poor knowledge about maintaining a semi-upright position in patients under mechanical ventilation. Comparing the scores of nurses before and after the OBE to maintain a semi-upright position in MVPs showed that the nurses' knowledge before and after the OBE were significantly different. Thus, the nurses' knowledge improved after training.

Based on the findings of this study regarding the position of MVPs during two weeks before nurses' training showed that 63.7% of the patients had appropriate position and 36.3% an inappropriate position. These results suggest that before training, a significant number of patients did not have a semi-upright position which shows the poor performance of nurses in providing services. That refers to lack of knowledge of nurses regarding the importance of semi-upright position in MVPs.

Also, regarding the position of MVPs during two weeks after training showed that 79.7% of them were in good condition and 20.3% of them were in unsuitable position. After conducting the study, the frequency of semi-upright position in patients was remarkable and a large number of patients observed this condition which refers to promotion of the knowledge of nurses and its effectiveness on their performance.

Comparing semi-upright position in MVPs before and after training nurses for two weeks, based on the present study objectives, confirms that frequency of appropriate position of the patients has increased from 63.7% before the intervention to 79.7% after the intervention. There was a significant difference between patients in terms of the ideal position, before and after carrying out nurses' training, which confirms the effectiveness of training on the performance of nurses. These results support that outcomes-based education has affected nurses' performance through increasing their knowledge and more patients were put in semi-upright position. According to the above-mentioned results, nurses lacked enough knowledge with regard to maintaining semi-upright position in MVPs before the OBE. However, after outcome-based education, their knowledge regarding maintaining a semi-sitting position in MVPs increased.

The overall objective of the current study was to determine the effect of OBE to maintain a semi-upright position in MVPs. According to what has been mentioned, outcome-based education has an effect on maintaining semi-upright position in MVPs through increasing nurses' knowledge and consequently on their better performance. The results of the present study were consistent with (Alaee et al., 2012) study in terms of effectiveness of OBE. They acknowledged the positive impact of education and training on the performance of nurses in caring patients under mechanical ventilation in ICUs. The results of the present study was also similar to the study findings of (Valizadeh et al. 2009) regarding the effectiveness of the outcomes-based education in promoting the competency of nursing students.

The current research is similar to a study regarding the effectiveness of outcome-based education on nursing performance and improving the quality of nursing care (Emamzadeh Ghasemi, Vanaki & Memarian 2004). The present study also supported the results of Haward (2006) study regarding the fact that the OBE model forms a framework out of the clinical competence concept in which nurses could apply high quality treatments and caregiving to all patients in terms of performance and decision-making and play their specialized, support-

ive, therapeutic, and managerial role in a more suitable quality than before (Haward 2006).

In addition, Kirk, Carlisle and Luker (1997) as well as Daly and Pamela (1992) pointed out that OBE would lead to a qualitative transformation in the level of knowledge and clinical competency of the student and the mentor that is consistent with this study.

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## Conflict of Interest

The authors declared no conflict of interests.

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